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The Influence of Race and Anxiety Level Upon Performance of Novel Motor Tasks Under Varying Stressful Conditions.

Roland Harold Vines
Louisiana State University and Agricultural & Mechanical College

THE INFLUENCE OF RACE AND ANXIETY LEVEL UPON PERFORMANCE OF NOVEL MOTOR TASKS UNDER VARYING STRESSFUL CONDITIONS

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by
Roland Harold Vines
B.S., George Peabody College, 1960
M.A., George Peabody College, 1961
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Dedicated to my wife Rona.

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ABSTRACT

This study sought to determine the influence of race and anxiety level upon performance of novel motor tasks under varying stressful conditions. Specifically, the purpose was to compare high and low anxious Negro and White subjects on novel motor tasks when performed under stress conditions of speed and suggested task failure. The A-Trait Scale of the State-Trait Anxiety Inventory was employed to determine anxiety levels of Negro and White male college students.

A total of 428 male students was tested approximately half of whom were from a primarily all Negro university and about half from a predominately white university. Seventy students from each university were selected as subjects on the basis of their scores on the A-Trait Anxiety Scale. Each subject was placed into one of the following groups: low anxious Negroes, low anxious Whites, high anxious Negroes, and high anxious Whites. Utilizing a counter-balanced practice order, the subjects performed under the following four experimental conditions: a simple motor task under the stress of speed alone; the same simple task under the stress of suggested task failure combined with speed; a complex task under the stress of speed alone; and the same complex task under the stress of suggested task failure combined with speed. The tasks consisted of pushing small sticks into holes on a board. The main difference between the two tasks was that the simple task allowed the subject to look directly at the board while performing

and the complex task required the subject to perform while looking into a mirror. Each subject was tested individually and was tested under all four conditions in succession.

A split-plot arrangement in a completely randomized design was used with each plot consisting of a 2 x 2 factorial arrangement of treatments. The main plot consisted of two races, Negro and White, and two anxiety levels, low and high. The sub-plot consisted of two tasks, simple and complex, and two stressors, speed and suggested task failure combined with speed.

The main findings in this study were:

1. The White subjects required significantly less time to perform under the experimental conditions than did the Negro subjects.
2. The low anxious subjects required less time to perform than the high anxious subjects under all experimental conditions regardless of race.
3. The White subjects performed significantly better than the Negro subjects under both stress conditions and for both tasks, with the difference becoming more prounounced in the complex tasks and under the suggested task failure condition.

The following conclusions seemed justified within the limitations of this study:

1. White college males are more proficient in performing a novel fine motor task under stress than Negro college males, regardless of anxiety level.

2. Low-trait anxious subjects, regardless of race, are able to perform significantly better than high-trait anxious subjects on novel motor tasks. The difference is more pronounced in a complex task than a simple task.

CHAPTER I

INTRODUCTION

The state of anxiety has been defined as the anticipation of some disturbing situation which is not yet physically present. With the anticipation of economic disaster, loss of loved ones, or any potential threat, one is likely to become very tense and possibly emotionally disturbed. Anxiety is certainly accompanied by a great deal of muscular tension in most individuals.[1]

People are often faced with the necessity of performing skilled tasks under conditions which are highly stressful. Such is obviously the case in athletic contests. The effectiveness of a quarterback or lineman must be maintained even when he is threatened with physical injury or by the need to hurry the performance of a complex task.

Physical educators have the opportunity almost daily not only to observe overt performance of students, but also to determine how they feel about participating, how they react to stresses of various kinds, and how they behave in a variety of situations. Various motivational techniques have

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[1] Ross Stagner and T. F. Karwaski, Psychology (New York: McGraw-Hill Book Co., 1952), p. 42.

been used as a means of encouraging individuals to perform better. It has been theorized that motivation produces a stressful situation and the process of resolving this stress produces greater effort. However, the results of this greater effort have hindered as well as improved performance. Some researchers have attributed these contrasting results to the anxiety level of the individual.[2,3]

According to Cratty,[4] the effect of level of anxiety upon performance is directly dependent upon the type of task considered. In most cases a heightened aroused state has been found to facilitate simple performance such as maze learning,[5] mental set,[6] and eyelid conditioning.[7] However, as

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[2]I. Maltzman, W. M. Smith, and Lloyd O. Brooks, "Some Effects of Different Training Conditions and Manifest Anxiety Upon Target Tracking," Perceptual and Motor Skills, V (1955), 185-191.

[3]Dean Ryan and W. L. Lakie, "Competitive and Non-Competitive Performance in Relation to Achievement Motive and Manifest Anxiety," Journal of Personality and Social Psychology, I (1965), 342-345.

[4]Bryant J. Cratty, Movement Behavior and Motor Learning (Second Edition; Philadelphia: Lea and Febiger Co., 1967), p. 163.

[5]Joseph D. Matarazzo, George A. Ulett, and George Saslow, "Human Maze Performance as A Function of Increasing Levels of Anxiety," Journal of General Psychology, LIII (1955), 281-285.

[6]I. Maltzman, Jack Fox and Lloyd Marrisett, Jr., "Some Effects of Manifest Anxiety on Mental Set," Journal of Experimental Psychology, XLVI (1953), 50-54.

[7]Kenneth W. Spence and Janet Taylor, "Anxiety and Strength of UCS as Determiners of the Amount of Eyelid Conditioning," Journal of Experimental Psychology, XLII (1951), 183-188.

anxiety reaches a certain level, a breakdown of psychological and physiological mechanisms is often seen to occur resulting in less efficient performance as the task becomes more complex. It has been reported that this result is very evident with high anxious subjects while generally the opposite has been evidenced in low anxious subjects.[8,9]

Certain responses of the autonomic nervous system such as increased heart rate and respiration and deflection of the galvanic skin resistance are held to be reliable and valid physiological indices of the psychological state of anxiety.[10,11]

Several psychological instruments have been developed to measure anxiety, one of the most recent being the State-Trait Anxiety Inventory. The Inventory is comprised of two separate self-report scales for measuring two distinct anxiety concepts: State Anxiety (A-State) and Trait Anxiety (A-Trait).

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[8]Robert Frances Baker, "The Effects of Anxiety and Stress on Gross Motor Performances," (unpublished Doctoral dissertation, University of California, Los Angeles, 1961), p. 98.

[9]Ryan, loc. cit.

[10]C. T. Morgan, Physiological Psychology, (New York: McGraw-Hill Co., 1965), p. 18.

[11]B. Martin, "The Assessment of Anxiety by Physiological Behavior Measures," Psychological Bulletin, LVIII (1961), 234.

The A-Trait Scale consists of a manifest anxiety scale designed to determine how the subject feels generally and has been used as a research tool in the selection of subjects of different anxiety levels.

The A-State Scale is used to determine the subject's immediate feelings at the time of completing the scale in order to evaluate the actual levels of anxiety intensity induced by stressful experimental conditions.[12]

A study which utilized the A-Trait anxiety levels of Negro college students reported that the results may be peculiar to the racial group used and that the conclusions should be restricted until further evidence was obtained on similar groups from comparable institutions.[13] Accordingly, Frisch and Handler[14] in their study of differences between Negroes and Whites concluded:

> This study hopefully highlights the care which must be taken in the interpretation of projective materials obtained from Negro clients when their interpretations are based on normative data, statistical or personal, which excludes this group.

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[12] Charles D. Spielberger, Richard L. Gorsuch and Robert E. Lushene, The State-Trait Anxiety Inventory Test Manual for Form X (Palo Alto, California: Consulting Psychologist Press, 1969), p. 1.

[13] Calvin O. Atchison, "Relationship Between Some Intellectual and Non-Intellectual Factors of High Anxiety and Low Anxiety Negro College Students," The Journal of Negro Education, XXXVII (1968), 174-178.

[14] Giara R. Frisch and Leonard Handler, "Differences in Negro and White Drawings - A Cultural Interpretation," Perceptual and Motor Skills, XX (1965), 131-134.

However, several researchers have compared races on various performance tasks without considering the anxiety levels. It should be noted that published reports of only two investigators were found that included the anxiety levels of the Negro population in their studies.[15, 16]

Smith,[17] while surveying the past performance charts of the Olympic Games, found what seemed to be an anthropological pattern of achievement. He noted that the Mongoloids, headed by the competitive Japanese, have done particularly well in gymnastics, swimming and wrestling. Negroes, particularly those from the United States, have dominated the shorter foot races, jumps and hurdles. The White athletes have ranged all the way from the best to the poorest in nearly every event.

The questions generally raised when discussing the comparative performances of the different races have usually centered around the projected

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[15] Atchison, loc. cit.

[16] Philip M. Bluhm and Wallace A. Kennedy, "Discrimination Reaction Time as a Function of Incentive-Related DRQ Anxiety and Task Difficulty," Perceptual and Motor Skills, XX (1965), 131-134.

[17] Marshall Smith, "Giving the Olympics and Anthropological Once-Over," Life, LVII (Oct. 1964), 81-84.

causes for differences in performance. In the following statement, Cobb[18] theorized that there were no racial differences to account for the different performances.

> There is nothing to suggest an association between race and competition in any particular event. There are Negro youths in nearly every phase of competition. The physiques of champion Negro and White sprinters reveal nothing to indicate that Negroid physical characteristics are anatomically concerned with the present dominance of Negro athletes in national competition in the short dashes and broad jump. There is not a single physical characteristic which all Negro stars have in common which would definitely identify them as Negroes.

Researchers in comparing Negroes and Whites have found a variety of differences in such areas as motor ability,[19] heat tolerance,[20] and motivation.[21] One question that most of the researchers have not investigated is the possibility that the anxiety level, rather than race, may be the primary influence affecting differences in performances. It has already been reported that individuals with different levels of anxiety perform differently according to the complexity of the task. It has also been stated that there is nothing to

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[18]Montaque W. Cobb, "Race and Runners," Journal of Health, Physical Education and Recreation, VII (Jan.1936), 1-8.

[19]Adele Rhodes, "A Comparative Study of Motor Abilities of Negroes and Whites, "Child Development, VIII (1937),369-371.

[20]Paul T. Baker, "Racial Differences in Heat Tolerance," American Journal of Physical Anthropology,XVI (1958),287-305.

[21]Joseph E. Hipple, "Racial Differences in the Influence of Motivation of Muscular Tension, Reaction Time, and Speed of Movement, "Research Quarterly, XXV (1954)297-306.

suggest an association between race and performance. Therefore, an understanding of the influence of race and anxiety level upon performance would seem to be of both theoretical and practical importance. This need was emphasized by Cratty[22] when he stated that there is a tremendous need for research investigating the influence of emotions, motivation and anxiety upon performance of motor tasks.

STATEMENT OF THE PROBLEM

The problem was to determine whether differences exist between Negroes and Whites while performing motor tasks under stressful conditions when anxiety level is held constant.

PURPOSE OF THE STUDY

The purpose of this study was to compare high and low anxious Negro and White subjects on novel motor tasks when performed under stress conditions of speed and suggested task failure.

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[22] Bryant J. Cratty, Psychology and Physical Activity (Englewood Cliffs, New Jersey: Prentic-Hall, Inc., 1968), p. 185.

SIGNIFICANCE OF THE STUDY

In the literature reviewed some investigators reported that Negro subjects performed better than White subjects while other investigators found that White subjects were superior to the Negro subjects in performance. However, these researchers failed to consider the anxiety levels of the subjects when comparing the races. A majority of studies found that low anxious subjects performed significantly better than high anxious subjects under stressful conditions and on the more complex tasks. It was further reported that when the tasks were simple and under low-stress conditions the high anxious subjects were superior in performance to the low anxious subjects. Therefore, it seems that the anxiety level of the subjects as well as the complexity of the task and the amount of stress present could be contributing factors to these different findings when comparing the races. The present study attempted to control the anxiety levels of Negro and White subjects while they performed tasks of different complexities and under varying stressful conditions. It is hoped that the results of this study will benefit the field of physical education by shedding more light on the individual differences of students and especially the need to consider the anxiety level as well as the task when setting up programs that are designed to achieve the best performance from each student. It is also hoped that the results of this study will aid coaches in achieving the maximum performance level from each

player and the team as a unit through a better understanding of the influence that anxiety level and race has upon performance under various conditions.

DELIMITATIONS OF THE STUDY

This study was delimited to the use of only two fine motor tasks, two stressors, and one geographical location. The number of subjects was limited to seventy Negroes and seventy Whites from two universities, one essentially all Negro and one predominantly White, in Baton Rouge, Louisiana. The determination of low and high anxiety levels was limited to one test.

LIMITATIONS OF THE STUDY

A possible limitation was that two different examiners gathered the data. One examiner was Negro and tested all the Negro subjects while the White examiner tested all of the White subjects.

Another possible limitation was that there may have been wide differences in intelligence, aptitude, background and interest that could have affected the performance scores.

There was also no way of knowing if the subjects were performing to the best of their ability under the experimental conditions or if they were being truthful in answering the A-Trait Scale.

DEFINITION OF TERMS

State Anxiety. State Anxiety was conceptulized as a transitory emotional state of condition of the human organism that was characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity.[23]

Trait Anxiety. Trait Anxiety referred to the relatively stable individual differences in anxiety proneness.[24]

State-Trait Anxiety Inventory (STAI). This inventory was comprised of two separate self-report scales for measuring two distinct anxiety concepts: State Anxiety (A-State) and Trait Anxiety (A-Trait).[25]

A-Trait Scale. This Scale contained twenty statements and was answered according to the general or usual feelings of the subject. In this study, the extreme scores were used for subject selection.

High Anxiety Subjects. This term referred to subjects scoring 45 or higher on the A-Trait Scale.

Low Anxiety Subjects. This term referred to subjects scoring 32 or lower on the A-Trait Scale.

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[23] Spielberger, op. cit., p. 2.

[24] Ibid.

[25] Ibid., p. 1.

Stress. For this study, stress was the subjecting of psychological pressure upon the performer.

Speed. Speed was a stressor used in which speed in performance was emphasized by a metronome ticking and by competing against the speed of the previous subject.

Suggested Task Failure. This term referred to a stressor used to make the subject feel that he was not performing as well as the previous subject.

Simple Motor Task. This task required the subject to push twelve inch sticks into holes on a board with no visual obstruction.

Complex Motor Task. This task required the subject to push six inch sticks into holes on a board while viewing the board through a mirror.

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature was organized under the following headings: (1) Studies Comparing Anthropometrical Measurements and Motor Performance of Negroes and Whites; (2) Studies Investigating the Infuence of Anxiety Levels upon Performance; and (3) Summary of Related Literature.

STUDIES COMPARING ANTHROPOMETRICAL MEASUREMENTS AND MOTOR PERFORMANCE OF NEGROES AND WHITES

Some differences in bodily proportions between American Negroes and White male college students as related to athletic performance were investigated by Metheny.[1] The subjects were fifty-one Negro and fifty-one White male college students. It was found that Negroes exceeded the Whites in weight, arm length, hand length, elbow width, leg length, low leg length, foot length and width, knee width, shoulder breadth, chest depth and width, neck girth, and limb girth. The Whites exceeded the Negroes in sitting height, total fat, hip width, and ilium width. It was concluded that these differences in bodily proportions could hinder

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[1]Eleanor Metheny, "Some Differences in Bodily Proportions Between American Negro and White Male College Students as Related to Athletic Performance," Research Quarterly, X (Dec. 1939), 41-53.

as well as aid athletic performance depending upon the task to be performed.

Lane and Mitchem,[2] in their study of anthropometric measures as predictors of buoyancy, used sixty-nine White and fifty-two Negro male college students as subjects. Seventeen anthropometric measures and four ratios were utilized as variables in computing the buoyancy predictions. It was concluded from this sample that the Negroes were anthropometrically different and generally experienced much greater difficulty with buoyancy than White males.

Racial differences in heat tolerance were researched by Baker[3] using certain anthropometric measures to match subjects. The physiological responses of forty-eight pairs of Negro and White soldiers matched for body fat, total weight and stature were studied under hot-wet and hot-dry conditions. The results indicated that under hot-wet conditions the Negroes had a higher physiological tolerance. Under hot-dry conditions the Whites had the higher tolerance while nude with no difference recorded with both groups clothed.

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[2] Elizabeth C. Lane and John C. Mitchem, "Buoyancy as Predicted by Certain Anthropometric Measurements," Research Quarterly, XXXV (Mar. 1964), 21-28.

[3] Paul Baker, "Racial Differences in Heat Tolerance," American Journal of Physical Anthropology, XVI (1958), 287-305.

An investigation was undertaken by Brown[4] in order to determine whether or not the Negro possesses neuro-muscular characteristics which could account for his outstanding performance in certain sport events, especially the sprints. In this comparison the patellar tendon reflex times of eighty-two White and eighty-one Negro subjects were analyzed. It was found that the average patellar tendon reflex time of the Negro group was significantly shorter than that of the White subjects. It was concluded that in light of what is known concerning the relation of reflex time to speed in sprinting, the faster patellar tendon reflex time of the Negro group suggests that their spinal responses might have a bearing on the speed of the Negro athletes in the sprints.

Cobb[5] stated, in an article in 1936, that since man has begun to measure the equality of his athletic performance with stop-watch and tape, he has constantly improved. This has been due not to a betterment of human stock or any racial differences, but to experience and better nurture. Cobb concluded that the split-second differences in the performances of the great Negro and White sprinters of past and present were insignificant from an anthropological standpoint.

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[4]Robert L. Brown, "A Comparison of the Patellar Tendon Reflex Time of Whites and Negroes," Research Quarterly, VI (1935), 121-126.

[5]Montague Cobb, "Race and Runners," Journal of Health, Physical Education and Recreation, VII (Jan. 1936), 1-8.

Hutinger[6] investigated the differences in speed between American Negro and White children as measured by performance in the 35-yard dash. Subjects were 402 Negro and 390 White students in the fourth, fifth, and sixth grades. They performed the dash twice with their best time representing their score. Differences in the mean scores indicated that the Negro children were superior to the White children. The Negro girls were significantly faster than the White girls in all grades, while the Negro boys were significantly faster than the White boys in the fourth and fifth grades with no significant differences between the sixth grade boys.

Racial differences as to the influence of motivation on muscular tension, reaction time, and speed of movement were researched by Hipple.[7] Sixty boys, aged twelve to fourteen years, were tested for speed of motor responses with equal numbers of Whites and Negroes in the control and experimental groups. It was found that racial differences were present with respect to the influence of the motivating agent. Improvement in speed of reaction time and movement time was motivated by a buzzer which signaled slower responses.

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[6]Paul W. Hutinger, "Differences in Speed Between American Negro and White Children in Performance of the 35 Yard Dash," Research Quarterly, XXX (Oct. 1959), 366-368.

[7]Joseph E. Hipple, "Racial Differences in the Influence of Motivation on Muscular Tension, Reaction Time, and Speed of Movement," Research Quarterly, XXV (Oct. 1954), 297-306.

There was no racial difference before motivation. The Whites significantly increased their speed of responses and muscular tension under informational motivation; the Negroes did not significantly improve. In reaction time, the Negroes improved only one-half as much as Whites and the Whites tension levels increased under motivation, while the Negroes tension levels did not increase. Also, it was found that the tension level and speed were negatively correlated for Negroes and positively correlated for Whites.

The purpose of a study conducted by Dugas[8] was to determine the influence of observers of the same race and a racially mixed audience on level of aspiration and gross motor performance of college males. Fifty-seven Negro and fifty-seven White college males were used as subjects and performed two motor tasks, striking power and bar hang. The results indicated that college males were not influenced by the racial composition of their group when measuring their aspiration or performance on gross motor tasks.

Lipe[9] conducted a study in which aspiration and motor performance levels of Negro and White sixth-grade students were investigated.

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[8]Edward Dugas, "The Influence of Observers of the Same Race and a Racially Mixed Audience on Level of Aspiration and Gross Motor Performance of College Males," (unpublished Doctoral dissertation, Louisiana State University, 1970).

[9]LeOra M. Lipe, "An Investigation of Aspiration and Motor Performance Levels of Negro and White Sixth-Grade Students," (unpublished Doctoral dissertation, Florida State University, 1970).

Ninety-six sixth grade subjects were randomly selected from four elementary schools, two predominately Negro and two predominately White. The test group was comprised of twenty-four Negro males, twenty-four Negro females, twenty-four White males, and twenty-four White females. Each subject was tested individually on a series of motor performance tasks. The results of an analysis of the performance tasks showed a significant difference between the Negro and White males in the sidestep task (agility) and the basketball goal shooting task, with the Whites performing significantly better on both tasks.

The relationship between race and physical fitness was investigated in two different studies by Pontieux and Barker.[10, 11] The same design was used in both studies, except the second study attempted to control, partial out, or hold constant the socioeconomic status of the subjects. The studies identified statistically significant relationship between race and measures of physical fitness included in the American Association for Health, Physical Education, and Recreation Youth Fitness Test. The findings showed that among the upper elementary grades, Negro children were significantly superior to White children on almost every item. When socioeconomic status was controlled, the Negro children were superior to the White children on more items.

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[10] N. A. Pontieux and D. G. Barker, "Relationships Between Race and Physical Fitness," Research Quarterly, XXXVI (Dec. 1965), 468-472.

[11] D. G. Barker and N. A. Pontieux, "Partial Relationships Between Race and Fitness with Socioeconomic Status Controlled," Research Quarterly, XXXIX (Oct. 1968), 773-775.

A comparison of the jumping ability of American Negro and White college male students was made by Herzstein.[12] A total of 226 Whites and 156 Negroes were tested on the Sargent Vertical Jump. The mean of the Negro students was found to be significantly higher than the mean of the White students on the test.

Rhodes[13] compared the motor abilities of Negroes and Whites. The purposes of the study were: to establish tentative norms of motor abilities for Negro children; to compare the motor abilities of Negro children with those of White children; and to compare the motor abilities of both groups of children with groups of adults of both races. The subjects were tested on speed in walking a path, speed in threading a needle, speed on a three hole test and speed in stylus tapping. It was concluded that as far as motor abilities of the kind measured by these tests were concerned, there was little, if any, difference between Negroes and Whites at any level of development.

Bluhm and Kennedy[14] studied the discrimination reaction time as a function of incentive-related state anxiety and task difficulty. This study was

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[12]Joseph Norman Herzstein, "A Comparison of the Jumping Ability of American Negro Male College Students with American White Male College Students as Measured by the Sargent Jump Test," (unpublished Masters thesis, University of Maryland, 1961).

[13]Adele Rhodes, "A Comparative Study of Motor Abilities of Negroes and Whites," Child Development, VIII (1937), 369-371.

[14]Philip M. Bluhm and Wallace A. Kennedy, "Discrimination Reaction Time as a Function of Incentive-Related DRQ Anxiety and Task Difficulty," Perceptual and Motor Skills, XX (1965), 131-134.

concerned with evaluating the effects of incentive-related, state anxiety on discrimination reaction time in terms of task difficulty. The subjects were 472 grade school children, equally representing Negro and White races. High-anxiety subjects were expected to have faster response time on simple tasks, while low-anxiety subjects would respond faster at the complex end of the scale, regardless of grade level, race, or incentive. This hypothesis was not supported by the findings of the study. State anxiety was significantly higher for Whites but for Negro subjects, anxiety was a factor only before the incentive conditions.

STUDIES INVESTIGATING THE INFLUENCE OF ANXIETY LEVELS UPON PERFORMANCE

Complex learning and conditioning as a function of anxiety was investigated by Farber and Spence.[15] This study was concerned with the performance of anxious and non-anxious subjects on a stylus maze. Two groups of forty subjects each, whose scores were respectively within the upper and lower twenty percent of scores on the Taylor Manifest Anxiety Scale, learned the maze. The maze performance of the anxious subjects was found to be significantly poorer than that of the non-anxious subjects. It was noted that as the task became more difficult the difference between the two groups became even greater.

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[15] I. E. Farber and Kenneth W. Spence, "Complex Learning and Conditioning as a Function of Anxiety," Journal of Experimental Psychology, XLV (1953), 120-125.

Ausubel, Schiff, and Goldman[16] studied the qualitative characteristics in the learning process associated with anxiety. High and low anxiety groups of fifty college students each were constituted from the upper and lower quintiles of a distribution of group Rarschach Anxiety Scores. Each subject was given a mirror tracing test and a blindfolded stylus maze test. The findings indicated that the low anxiety group was significantly superior to the high anxiety group on the first trial of the maze, but this superiority was not maintained over the course of ten trials. No differences were obtained in the mirror tracing test.

In researching the influence of manifest anxiety in stylus maze learning, Axelrod, Cowen, and Heilizer[17] used the same design as Farber and Spence.[18] Ninety-six male and female subjects were selected to perform the stylus maze task. The subjects were grouped into high, medium and low anxiety scale. It was predicted that high anxious subjects would perform more poorly than the low anxious, and this difference would get progressively worse as the task became more difficult. The results did not support this prediction in that

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[16]D. P. Ausubel, H. M. Schiff, and M. Goldman, "Qualitative Characteristics in the Learning Process Associated with Anxiety," Journal of Abnormal and Social Psychology, XLVIII (1953), 537-547.

[17]Howard S. Axelrod, Emory L. Cowen, and Fred Heilizer, "The Correlates of Manifest Anxiety in Stylus Maze Learning," Journal of Experi-Mental Psychology, LI (1956), 131-138.

[18]Farber, loc. cit.

no significant relationship between difficulty and differential performances between high and low anxiety groups was found.

The specific theoretical implication investigation by Taylor and Spence[19] was that the performance of anxious subjects would be inferior to that of non-anxious subjects in a learning situation that involved the presence of competing responses. Two groups of twenty subjects each were chosen on the basis of extreme scores made on a test of manifest anxiety. The high scores represented anxious subjects and low scores represented non-anxious subjects. The results indicated that the anxious group made a significantly greater number of errors and required a larger number of trials to reach the criterion. It was also noted that the most competitive responses provided the greatest differences between the two groups.

Matarozzo, Ulett, and Saslow[20] investigated human maze performance as a function of increasing levels of anxiety. The hypothesis was that anxiety would facilitate learning up to a point, but beyond that point increased anxiety

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[19]Janet A. Taylor and Kenneth W. Spence, "The Relationship of Anxiety Level to Performance in Serial Learning," Journal of Experimental Psychology, XLIV (1952), 61-64.

[20]Joseph D. Matarozzo, George A. Ulett, and George Saslow, "Human Maze Performance as a Function of Increasing Levels of Anxiety," Journal of General Psychology, LIII (1955), 79-93.

would hinder learning. The subjects were 101 college male students and were placed into groups ranging from high to low according to scores achieved on the Taylor Manifest Anxiety Scale.

Two measures of learning were used, time and trials to reach the criterion. The results, when time was the measure of learning , supported the hypothesis; but when trials were the criterion, no significant difference was found between the anxious and non-anxious groups.

Competitive and non-competitive performances in relation to achievement, motive, and manifest anxiety were studied by Ryan and Lakie.[21] From a group of 350 males, 20 college students with the highest scores and 20 with the lowest scores on the Taylor Manifest Anxiety Scale were selected as subjects. The subjects performed initially on a perceptual motor task under non-competitive conditions and then were tested on the same apparatus in a face-to-face competitive situation. It was found that the high anxious-low need for achievement group performed significantly better under non-competitive conditions, while the low anxious-high need for achievement group made significantly greater gains during competition.

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[21]Dean E. Ryan and W. L. Lakie, "Competitive and Non-Competitive Performance in Relation to Achievement, Motive, and Manifest Anxiety," Journal of Personality and Social Psychology, I (1965), 342-345.

Palermo, Castaneda, and McCandless[22] studied the relationship of anxiety in children to performance in a complex learning task. This experiment was concerned with the relationship of anxiety level to performance in a trial-and-error learning situation. A group of thirty-six fourth grade subjects were chosen on the basis of extreme scores on a manifest anxiety test with eighteen subjects each in the high and low anxious groups. Both groups performed a motor task involving the presence of competing responses. It was found that the anxious subjects made significantly more errors in the learning task than the non-anxious subjects.

A study by Montaque[23] investigated the role of anxiety in serial rote learning. All forty subjects were undergraduates and were selected on the basis of scores obtained on the Taylor Manifest Anxiety Scale. A Hull-type memory drum was used with three lists of three-letter nonsense syllables of twelve syllables each typed on a white tape with each list becoming more difficult.

Anxious and non-anxious subjects were randomly assigned to one of the three lists. The results showed that the anxious subjects performed less well

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[22]David E. Palermo, Alfred Castaneda and Boyd McCandless, "The Relationship of Anxiety in Children to Performance in a Complex Learning Task," Child Development, XXVII (1956), 333-337.

[23]E. K. Montaque, "The Role of Anxiety in Serial Rate Learning," Journal of Experimental Psychology, XLV (1953), 91-96.

than non-anxious subjects on the difficult list. However, the anxious subjects were superior to the non-anxious subjects on the easier list.

O'Neil, Hansen, and Spielberger[24] investigated the effects of state and trait anxiety on computer-assisted learning. The performances of high A-Trait -- low A-State subjects were superior to any other group, while the performances of low A-Trait --high A-State subjects were inferior to all other groups. It was also noted that the average high A-Trait subjects had higher A-State scores than low A-Trait subjects. However, when A-Trait scores were considered alone, they were found to be unrelated to performance. In other words, there was no significant difference between high and low anxious individuals in performance.

Slevin[25] researched the influence of trait and state anxiety upon performance of a novel gross motor task under conditions of competition and audience. Based on scores achieved on the STAI-A-Trait Scale, two groups of forty high anxious and forty low anxious subjects were formed. Each subject performed under four experimental conditions. It was found that low anxious subjects

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[24]H. F. O'Neil, Jr., D. N. Hansen, and C. D. Spielberger, "The Effects of State and Trait Anxiety on Computer-Assisted Learning," (unpublished paper presented at the meeting of the American Education Research Association, Los Angeles, 1969).

[25]Robert Lee Slevin, "The Influence of Trait and State Anxiety upon the Performance of a Novel Gross Motor Task under Conditions of Competition and Audience," (unpublished Doctoral dissertation, Louisiana State University, 1970).

performed significantly better and exhibited less state anxiety under all conditions than did the high anxious subjects. It was also noted that a significant negative relationship was evidenced between trait anxiety and performance.

The effect of anxiety, motivational instruction, and failure on serial learning was researched by Sarason.[26] The Taylor Manifest Anxiety Scale was administered to 180 college students with equal numbers of males and females. Two groups consisting of fifteen high and fifteen low anxious subjects were formed. High and low motivating instructions were administered prior to learning. The results revealed that high motivational instructions were detrimental for high anxious subjects.

In another study, Sarason[27] investigated the influence of anxiety levels and two kinds of motivating instructions on verbal learning. This study used the scores of seventy-five college students on the Taylor Manifest Anxiety Scale to establish low and high anxiety groups. Differential motivating instructions were given on tests of serial learning and retention of nonsense syllables. It was found that the high anxious non-motivated group was superior to the low anxious non-motivated group, but the low anxious motivated group was superior to the high anxious motivated group.

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[26] Irvin Sarason, "Effect of Anxiety, Motivational Instruction and Failure on Serial Learning," Journal of Experimental Psychology, LI (1956), 253-260.

[27] Irvin G. Sarason, "Effect of Anxiety and Two Kinds of Motivating Instruction on Verbal Learning," Journal of Abnormal and Social Psychology, LIV (1957), 166-171.

Taylor[28] researched the relationship of anxiety to the conditioned eyelid response. Two groups of thirty subjects each were chosen on the basis of extreme scores made on a test of manifest anxiety, those with high scores representing the high anxious group and those with low scores representing the low anxious group. Both groups were tested in a conditioned eyelid situation in which each group received relatively strong and weak puffs of air. During the course of the conditioning trails, differential instructions designed to raise or lower the anxiety level were administered. The results indicated that the differential instructions had little or no effect upon performance. The high-anxious group was consistently superior in the amount of conditioning to the low-anxious group throughout the course of the conditioning trials.

Manifest anxiety in relation to level of performance on a complex perceptual-motor task was investigated by Shepard and Abbey[29] using the Toronto Complex Coordinator. Twenty-eight low anxious and twenty-eight high anxious subjects were chosen from scores on a manifest anxiety test. It was found that the non-anxious group was superior to the anxious group in terms of both a higher number of matches and a lower error-match ratio.

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[28]J. A. Taylor, "The Relationship of Anxiety to the Conditioned Eyelid Response," Journal of Experimental Psychology, XLI (1951), 81-92.

[29]A. H. Shepard and D. S. Abbey, "Manifest Anxiety and Performance on a Complex Perceptual Motor Task," Perceptual and Motor Skills, VIII (1958), 327-330.

Maltzman, Smith, and Brooks[30] researched the effects of different training conditions and manifest anxiety upon target tracking. Eighty college student volunteers served as subjects. The study was concerned with the investigation of certain variables affecting the tracking of a single target and the proficiency in shifting to the tracking of a second target. The variables were the amount of practice on one target, target speed during practice, and manifest anxiety level. Indications were that manifest anxiety was significantly related to proficiency in tracking a single target in a long practice condition. Subjects having a relatively large number of target hits had significantly lower anxiety scores than subjects obtaining relatively few hits.

In another study, Maltzman, Fox, and Marrisett[31] investigated two different problem-solving situations involving the effect of anxiety upon the establishment of mental set. Each problem used different subjects rated as high or low anxious by scores on an anxiety test. A water jar problem was used in the first experiment. It was found that the tendency to shift to a more direct method of solution was inversely related to the level of anxiety. In the second experiment anagrams were used to establish mental set. Subjects with high anxiety commited significantly fewer errors than subjects with low anxiety.

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[30]Irving Maltzman, William M. Smitn, and Lloyd O. Brooks, "Some Effects of Different Training Conditions and Manifest Anxiety upon Target Tracking," Perceptual and Motor Skills, V (1955), 185-191.

[31]Irving Maltzman, Jack Fox, and Lloyd Marrisett, Jr., "Some Effects of Manifest Anxiety on Mental Set," Journal of Experimental Psychology, XLVI (1953), 50-54.

Nash, Phelan, Demos, and Bittner[32] studied the effects of manifest and induced anxiety and experimenter variability on simple reaction time. Thirty-six female college students were placed in low, medium, high anxiety groups based on their scores on the Taylor Manifest Anxiety Scale. Each subject was tested under stress or no-stress conditions on simple reaction time. The results indicated that there was no interaction in reaction time data among levels of manifest anxiety and the presence or absence of stress.

The effects of anxiety and stress on gross motor performance was researched by Baker[33] using high anxious and low anxious subjects. A test consisting of walking a specified fast pattern on a treadmill at two miles per hour for ninety seconds was administered to all subjects. He found that stress inhibited the efficient functioning of high anxiety subjects while facilitating the performance of low anxious subjects.

Longnecker[34] investivated perceptual recognition as a function of anxiety, motivation, and the testing situation. Seventy-two male college

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[32] Ed L. Nash, Joseph G. Phelan, George Demos, and Al Bittner, "Effects of Manifest and Induced Anxiety and Experimenter Variability on Simple Reaction Time," Perceptual and Motor Skills, XXII (1966), 483-487.

[33] Robert Francis Baker, "The Effects of Anxiety and Stress on Gross Motor Performance," (unpublished Doctorial disseratation, University of California, Berkley, 1961).

[34] E. D. Longnecker, "Perceptual Recognition as a Function of Anxiety, Motivation, and the Testing Situation," Journal of Abnormal and Social Psychology, LXIV (Mar. 1962), 215-221.

students with middle range scores on an intelligence test and extreme scores on a manifest anxiety scale were selected as subjects. A series of five perceptual recognition tests was administered individually to all subjects under stress and no-stress conditions. In the stress situations, the low anxiety group performed significantly better than the high anxious group. Under the no-stress condition the high anxious group performed significantly better than the low anxious group.

Hodges[35] found that STAI-A-State scores of undergraduate students increased from a rest period to a stress period for subjects exposed to two different stress conditions. One of the stress conditions was the failure-threat condition, in which each subject was told he was not performing as well as the others. In this condition, it was found that the magnitude of change in STAI-A-State scores was greater for subjects with high levels of A-Trait than for low A-Trait subjects. In the other stress condition, the shock-threat condition, no relationship was found between A-Trait and A-State anxiety scores.

Castaneda, Palesno, and McCandless[36] investigated complex learning and performance as a function of anxiety in children and task difficulty.

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[35]W. F. Hodges, "The Effects of Success, Threat of Shock and Failure on Anxiety," (unpublished Doctoral dissertation, Vanderbilt University, Nashville, 1967).

[36]Alfred Castaneda, David Palesno and B. R. McCandless, "Complex Learning and Performance as a Function of Anxiety in Children and Task Difficulty," Child Development, XXVII (1956), 328-332.

The study was concerned with the performance of fifth grade children in a complex learning task as a function of their scores on a manifest anxiety scale and the relative difficulty of the various components comprising the task. The high anxious group was comprised of twenty-one children and the low anxious group had sixteen subjects. A significant interaction was found between anxiety and task difficulty. The high anxious children had a tendency to be inferior, in comparison with the low anxious, on the difficult components of the task. However, there was a tendency for the high anxious children to be superior to the low anxious group on the less difficult components.

Averbach[37] examined the effects of orienting instructions and feedback about performance on level of A-State for male college students. Prior to the administration of a work-completion task, students with high anxiety and low anxiety (A-Trait) scores were informed that they would be given an intelligence test or a practice task. During the task, two groups were interrupted and given either success or failure feedback about their performance. The results showed that the orienting instructions had no effect upon the A-State scores of either low or high anxious subjects. Also, no difference in performance was found between the low and high anxious subjects on either feedback condition.

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[37] S. M. Averbach, "Anxiety and Time Estimation," (unpublished Masters thesis, Florida State University, 1969).

Matarazzo and Matarazzo[38] utilized eighty White males in a study of anxiety level and pursuitmeter performance. The subjects were divided into five groups according to their scores on the Taylor Manifest Anxiety Scale. The learning task involved performance on a complex, double-disk pursuitmeter. No statistical relationship was found between either of the learning measures and anxiety level.

Relationships between some intellectual and non-intellectual factors of high anxiety and low anxiety Negro college students were researched by Atchison.[39] One hundred sixty college students were administered the Taylor Manifest Anxiety Scale, a mental ability test and an adjustment test. The subjects were divided into a low anxiety group and a high anxiety group. The low anxiety group scored from zero to eleven and the high anxiety group scored above sixteen on the Anxiety Scale. The findings yielded correlations between non-intellectual factors of the low anxiety and high anxiety subjects that were all positive but insignificant with three exceptions. The low anxiety subjects had significant positive correlations between manifest anxiety scores and grade point average, intelligence quotient and incomplete sentence blank. It was concluded that the findings do not agree with many studies using college students and may be peculiar to the racial group used.

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[38]Ruth Matarazzo and Josehp D. Matarazzo, "Anxiety Level and Pursuitmeter Performance," Journal of Consulting Psychology, XX (1956), 164-167.

[39]Calvin O. Atchison, "Relationships Between Some Intellectual and Non-Intellectual Factors of High Anxiety and Low Anxiety Negro College Students," Journal of Negro Education, XXXVII (1968), 174-178.

SUMMARY OF RELATED LITERATURE

Section I of this chapter was concerned with studies comparing anthropometric measures and motor performance of Negroes and Whites. Three researchers investigated the anthropometric differences of Negroes and Whites and found that the bodily proportions varied greatly between the races. One author stated that these differences could hinder as well as aid performance depending upon the task to be performed. Another author concluded that these differences were insignificant from a performance standpoint.

In four other studies, the investigators found that the Negroes were significantly better than the Whites in running speed, vertical jumping and physical fitness. One investigator found that the Whites significantly out performed the Negroes on an agility test and in basketball shooting. It was also reported that there was no significant difference between Negroes and Whites on a series of fine motor performances and that racial grouping had no significant influence upon the performance of gross motor tasks.

Section II was concerned with studies investigating the influence of anxiety levels upon performance. In twelve of the studies reviewed, the authors reported that low anxious subjects performed significantly better than high anxious subjects under highly motivated conditions and on the more complex tasks. However, five studies revealed that the high anxious subjects were superior to the low anxious subjects when performing under low stress conditions and when the tasks were simple. Three other investigators concluded that there

was no significant difference between low and high anxious subjects in motor performance. The only study utilizing the anxiety levels of Negro subjects found a significant positive correlation between manifest anxiety scores and grade point average for the low anxious subjects.

CHAPTER III

PROCEDURE OF THE STUDY

OVERVIEW

This study was conducted during the 1970-1971 school year at Louisiana State University and Southern University in Baton Rouge, Louisiana.

There were 428 male students tested with seventy Negroes and seventy Whites being selected as subjects on the basis of race and selected scores achieved on the STAI-A-Trait Scale. Each subject was assigned to one of four experimental groups with each group consisting of thirty five subjects. There was a low anxious Negro group and a low anxious White group with A-Trait scores ranging from 25 through 32; and a high anxious Negro group and a high anxious White group with scores ranging from 45 through 59.

Each subject performed under the following four experimental conditions: Condition I involved a simple motor task under the stress of speed; in Condition II the subjects were given the same simple task under the stress of speed and suggested task failure; Condition III involved a complex motor task under the stress of speed; and Condition IV involved the same complex task under the stress of speed and suggested task failure. The order of performing under the conditions was counter-balanced to offset possible variables such as fatigue, learning, and increased anxiety.

The score for each condition was recorded and a split-plot analysis of variance in a completely randomized design was used to analyze the data for any significant differences. The main plot and the sub plot consisted of seperate 2 x 2 factorial arrangements of treatments. The main plot consisted of Negro and White races, and low and high anxiety levels. The sub plot consisted of simple and complex tasks, and speed and suggested task failure combined with speed stressors.

SELECTION OF SUBJECTS

The subjects for this study were selected from physical education classes at Southern University and Louisiana State University in Baton Rouge, Louisiana.

Of the 428 potential subjects tested a total of 140 male subjects were selected. The criteria for selection as subjects were race and selected scores ranging from 25 to 32 (low anxiety) and from 45 to 59 (high anxiety) on the STAI-A-Trait Scale. Each subject that was chosen from one race was matched with a subject of the other race which had the same A-Trait score.

Thirty-five subjects were assigned to each of four experimental groups: Group I consisted of low anxious Negroes; Group II contained low anxious Whites; Group III contained high anxious Negroes; and Group IV consisted of high anxious Whites.

RESEARCH ASSISTANT

A graduate student attending Southern University and majoring in physical education was selected as the assistant. The assistant was Negro and collected all the data on the Negro subjects because it was felt a White examiner might induce an additional stress upon the Negro subjects that was not induced upon the White subjects. Before the actual data were collected, the assistant tested several students and instructors in order to become proficient in the administration and testing procedures. The assistant was also thoroughly acquainted with every aspect of the study.

TESTING EQUIPMENT

Target Board. A rectangular board twelve inches high and twenty-four inches long with two different patterns and sizes of holes was used as the target board. One pattern of holes had a diameter of three-eights inch and the other pattern had holes with one-half inch diameters. (See Figure 1)

Base Board. This was the board on which the target was mounted and where the sticks were placed before each experimental condition. (See Figure 1)

Sticks. Twelve sticks with diameters of one-quarter inch were used in the study. Six sticks twelve inches in length were used for the simple task, and six sticks six inches in length were used for the complex task. (See Figure 1)

Metronome. A metronome, set at 120 beats per minute was utilized as a part of the stress conditions by emphasizing the passage of time. (See Figure 1)

Whistle. An official's whistle was used to inform and motivate the subject during the suggested task failure performances. (See Figure 1)

Curtain and Holders. A curtain ten inches high and twelve inches wide was mounted ten inches in front of the target board while the subject performed the complex task. (See Figure 1)

Stop Watch. A stop watch was used to record the time taken by each subject for each performance. (See Figure 1)

Mirror. A mirror was used by the subjects to view the target board behind the curtain while performing the complex task. (See Figure 1)

ORDER OF PRESENTATION OF THE TESTING PROCEDURE

The A-Trait Scale was administered to 428 potential subjects. After the Scale was scored, the students who qualified as either high anxious or low anxious subjects were contacted and asked to participate in the second phase of the study. Each subject was told that this phase would only take approximately ten minutes and that no preparation was necessary. It was explained that the tasks to be performed consisted of pushing sticks into holes on a board and the reason for this phase was to test the motor ability of college males. If the subject was willing to participate, the time and place for testing were arranged. When the subject arrived at the testing area, the four experimental conditions were administered. The order of performing under the conditions was predetermined for each subject. This was done to offset possible variables such as fatigue, learning, and increased anxiety.

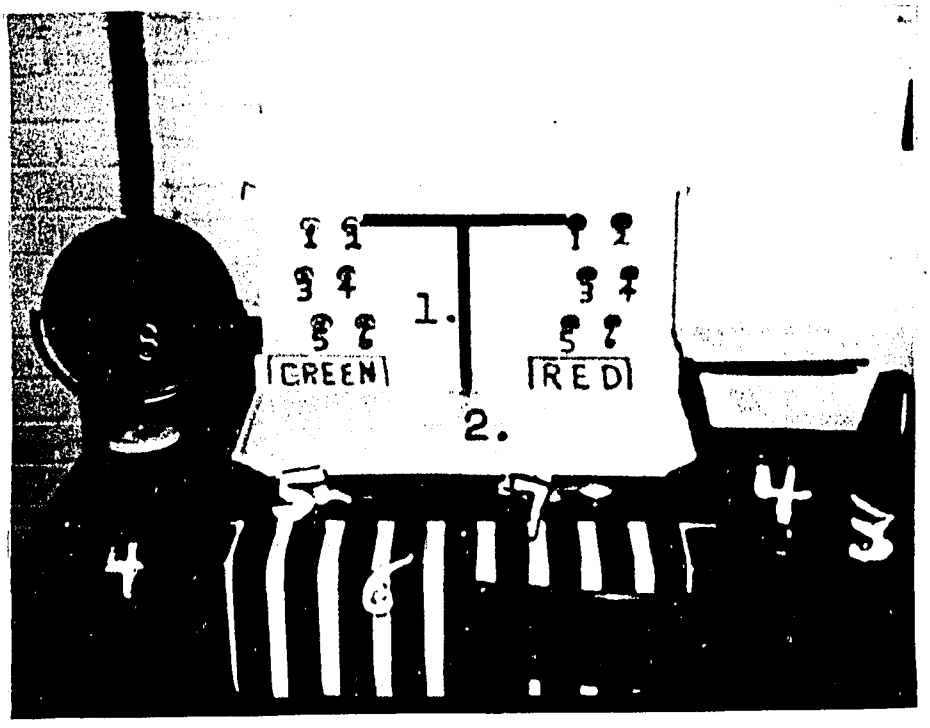

FIGURE 1

TESTING EQUIPMENT USED IN THE PERFORMANCE TASKS

1. Target Board
2. Base Board
3. Metronome
4. Sticks
5. Whistle
6. Curtain
7. Stop Watch
8. Mirror

One order of administering the experimental conditions was as follows: The subject was tested on the simple task under the stress of speed alone (Experimental Condition I); next the same simple task was administered under the stress of speed and suggested task failure (Experimental Condition II); at that point the changes necessary for the complex task were made while the subject remained seated. The time necessary for the changes was approximately fifteen seconds. Immediately following the changes, the subject performed the complex task under the stress of speed (Experimental Condition III), and the last test consisted of performing the same complex task under the stress of speed and suggested task failure (Experimental Condition IV). After the score for each condition was recorded, the subject was thanked and allowed to leave.

The subject performed the four experimental conditions in succession. It required approximately five minutes to complete all tests. Each subject was tested individually and no spectators or other subjects were allowed to observe while a subject was being tested. The examiner for the Negro subjects was Negro and the examiner for the White subjects was white. The examiner stood beside the subject throughout the testing session.

DESCRIPTION AND ADMINISTRATION PROCEDURES FOR THE STAI-A-TRAIT SCALE

Description of the STAI-A-Trait Scale

The A-Trait Scale consisted of a manifest anxiety scale containing twenty statements. The subject was asked to choose one of the following four responses as to how he generally felt about each statement: "Almost Never, Sometimes, Often or Almost Always". Each statement was scored on a four-point system with the point system being reversed for some of the statements. The higher scores represented greater degrees of anxiety. The results of the A-Trait Scale were used to determine which students would be selected to serve as subjects for this study. The A-Trait Scale is presented in Appendix B.

The test-retest reliability for the State Trait Anxiety Inventory (STAI) A-Trait Scale using undergraduate college students resulted in correlations from .73 to .86. The Alpha coefficients for the STAI A-State and A-Trait Scales were computed by formula K-R 20 as modified by Cronbach[1] using college undergraduate and high school students. The resulting coefficients ranged from .83 to .92. The A-Trait Scale was found to correlate moderately high with the Taylor Manifest Anxiety Scale, and it was concluded that either scale can be considered as alternate measures of A-Trait.[2]

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[1] L. J. Cronbach, "Coefficient Alpha and the Internal Structure of Tests," Psychometrika, XVI (1951), 297-335.

[2] Spielberger, op. cit., pp. 18-21.

Administration of the A-Trait Scale

The A-Trait Scale was administered under the title, Personality Inventory. The students were told that the study was being conducted in order to determine personality traits among college males. The Scale was given to 214 Negro and 214 White college male students during physical education class periods. As each student arrived, he signed his name on a numbered roll sheet and was given a copy of the scale which had the same number as the number beside his name. This method was used so that the student would not have to put his name on the Scale. After the students were given a copy of the Scale and were seated, they were asked to read the instructions very carefully. It was emphasized that truthfulness was imperative, and that the responses should be in terms of the way they usually felt. They were also reminded to leave their name off the inventory in hopes of eliciting more truthful responses. After questions were called for and answered, the students completed the Scale. The Scale took approximately twelve minutes to complete.

After the Scale was scored, the scores were arranged numerically from the lowest to the highest for each race. Rather than using the norms established for this inventory, each score of one race was matched with an identical score of the other race using the lowest and highest scores possible. This process eliminated a few extremely low and high socres. The low anxious groups scores ranged from 25 through 32, which was in the upper twenty per cent of the scores and the high anxious groups scores ranged from 45 through 59, which fell within

the lower twenty per cent of the scores. Using those scores, the subjects were selected for the four experimental groups.

DESCRIPTION AND ADMINISTRATION PROCEDURES FOR THE PERFORMANCE TASKS

Simple Motor Task

The subject was seated directly in front of the target board in a position where the shoulder of the dominant hand was centered between the two targets. He sat in an upright position allowing the fingertips of his dominant hand to touch the base of the target board. The dominant hand was considered to be the hand with which he wrote. The six sticks used to perform the task were placed on the baseboard with the colored tips nearest the subject. The subject picked up one stick at a time by the colored tip not letting the fingers extend beyond the colored area with the index finger on the upper surface of the stick. Using the dominant hand, the subject pushed each stick into a green target hole in the numbered order from one to six. The subject then took each stick out of the green target in the same order in which they were inserted and immediately pushed each stick through the corresponding numbered red target hole. Once the subject had pushed all six sticks through the correct red target holes the test was completed. The score was the number of seconds taken to complete the test. (See Figure 2)

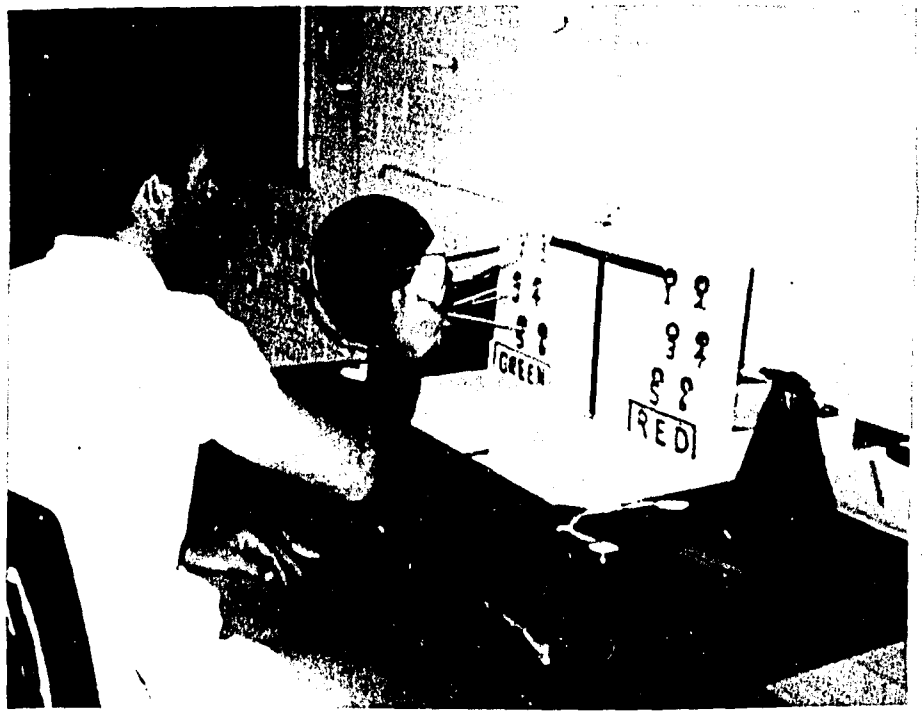

FIGURE 2

PERFORMING THE SIMPLE TASK UNDER EXPERIMENTAL CONDITIONS ONE AND TWO

After the task had been explained to the subject he was allowed to ask any questions and to practice the task by pushing two sticks into the green target and after pulling them out, pushing them through the red targets.

Complex Motor Task

The subject was seated in front of the target board with the shoulder of his dominant hand centered between the two targets. The six sticks used to perform this task were placed on the baseboard with the colored tips pointing toward the subject's dominant hand. The sticks for this task were six inches shorter than the sticks used on the simple task in order to help eliminate any learning and to aid in the performance of the task. A curtain was attached to the target board in such a manner that it obstructed the view of the target board and the sticks. The subject sat as near the target board as he desired and a mirror was placed on his left side near the target board. The subject was instructed to adjust the mirror so that he could see all target holes, numbers, and sticks. The testing and scoring procedures were the same as for the simple tasks. (See Figure 3)

STRESSORS

Speed

Under the stress of speed, the subject was encouraged to perform as rapidly as possible from the starting signal until the last stick had been pushed

FIGURE 3

PERFORMING THE COMPLEX TASK UNDER EXPERIMENTAL CONDITIONS THREE AND FOUR

through the hole. The subject was informed that his score was the number of seconds necessary to complete the task. The subject was further encouraged to perform faster by beginning each test with the words: "Get ready, set, go".

Suggested Task Failure Combined with Speed

Under this stressor, the subject was given the same instructions as were given under the speed stressor condition. He was also told that a whistle would sound after he had taken one-fourth, one-half, three-fourths, and the total time that the previous subject had taken in performing the same task. Actually, the whistle was blown at the following predetermined intervals: the first whistle was sounded when the subject had pushed the third stick into the green target; the second whistle was blown when the fifth stick was pushed into the green target; the third whistle was sounded when the second stick was pushed through the red target; and the last whistle was blown when the fifth stick was being pushed through the red target.

PILOT STUDY

The pilot study was conducted during the fall semester, 1970-1971 at Louisiana State University, Baton Rouge, Louisiana. The purposes of the pilot study were to determine whether significant improvement occurred when repeating the four experimental conditions after a period of one minute and to perfect the administration procedure of each test.

Sixteen college males were selected to serve as subjects and each was tested under the four experimental conditions using a predetermined order for performing. From the results of these performances, it was obvious that the complex task was much more difficult than the simple task. After each subject completed his performances, he was asked if the whistle, which suggested that he was doing poorly, influenced his perfromance any more than speed alone. The majority of the subjects responded that the sound alarmed them and made them much more cognizant of the need to hurry and consequently they tried to perform faster.

Utilizing the difference method for correlated means, t-tests were computed which showed that there was no significant increase in performance scores upon repeating the experimental conditions.

STATISTICAL ANALYSIS

The data for this study were collected from the scores on the A-Trait Anxiety Scale and the performances under the four experimental conditions. To determine whether significant differences existed among the four groups in each experimental condition, a split-plot 2 x 2 factorial analysis of variance in a completely randomized design was used. The main plot consisted of two races and two anxiety levels; the sub-plot consisted of two tasks and two stressors. The results of these comparisons were tested against the null hypothesis for acceptance or rejection. If the F-ratio reached the .05 level of probability, it was accepted as significant.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The data in this study consisted of performance scores achieved by 140 subjects on a series of four tests, a total of 560 different performances. Comparisons were made to determine whether there were significant differences between the scores of the Negro and White subjects with low and high anxiety levels while performing two motor tasks under the influence of two stressors.

A split plot 2 x 2 factorial arrangement of treatments in a completely randomized design was used to analyze the data. The main plot consisted of two races, Negro and White, and two anxiety levels, low and high. The subplot consisted of two tasks, simple and complex and two stressors, speed and suggested task failure combined with speed.

The analysis of variance for time of performance by races, anxiety levels, stressors, and tasks is presented in Table I.

COMPARISON OF NEGRO AND WHITE SUBJECTS

There were seventy subjects in the White group and seventy subjects in the Negro group. Each subject had four performance scores. The mean performance time was 46.08 seconds for the White group and 56.31 seconds for the Negro group.

TABLE I

ANALYSIS OF VARIANCE FOR PERFORMANCE SCORES BY RACES, ANXIETY LEVELS, STRESSORS AND TASKS

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F	P
Race	1	14637.09	14637.09	35.53	.01
Anxiety Level	1	3738.94	3738.94	9.08	.01
Race and Anx. Level	1	1386.00	1386.00	3.36	NS
Subjects/Race and Anxiety Level	136	56031.50	412.00		
Stress	1	139.00	139.00	<1	NS
Task	1	296654.14	296654.14	1994.18	.01
Stress and task	1	36.52	36.52	<1	NS
Race and Stress	1	1012.52	1012.52	6.81	.05
Race and Task	1	7366.00	7366.00	49.52	.01
Race and Task and Stress	1	492.19	492.19	3.31	NS
Anxiety Level and Stress	1	406.30	406.30	2.73	NS
Anxiety Level and Task	1	2252.02	2252.02	15.14	.01
Anxiety Level and Stress and Task	1	198.02	198.02	1.33	NS

TABLE I

(Cont.)

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F	P
Race and Anxiety Level and Stress	1	88.80	88.80	<1	NS
Race and Anxiety Level and Task	1	1263.00	1263.00	8.49	.01
Race and Anx. Level and Stress and Task	1	34.50	34.50	<1	NS
Error (b)	408	60693.24	148.76		
total	559	446429.78			

For 1 and 136 degrees of freedom the "F" ratio needed at the .05 probability level was 3.92 and at the .01 probability level, 6.84.

For 1 and 408 degrees of freedom the "F" ratio needed at the .05 probability level was 3.86 and at the .01 probability level, 6.69.

The F-ratio for the comparison between races was found to be 35.53 and was significant at the .01 level of probability as shown in Table 1. This indicated that the White subjects required significantly less time to perform under the experimental conditions than the Negro subjects.

COMPARISON OF HIGH ANXIOUS AND LOW ANXIOUS SUBJECTS

The mean performance time for the low anxiety group was 48.61 seconds and for the high anxiety group, 53.78 seconds. The F-ratio for the comparison between anxiety levels was 9.08 which was significant at the .01 significance level. (See Table I). This indicated that the low anxiety subjects performed the tasks in significantly less time than the high anxiety subjects.

INTERACTION OF RACE AND ANXIETY LEVEL

There were thirty-five subjects in each of four experimental groups with 140 performance scores per group. The mean performance times were: 52.15 seconds for the low anxious Negroes; 60.46 seconds for the high anxious Negroes; 45.07 seconds for the low anxious Whites; and 47.09 seconds for the high anxious Whites.

The race and anxiety level interaction F-ratio was 3.36 which was not significant. (See Table I). This was interpreted to mean that the difference between anxiety levels was consistent over races and the difference between races was consistent over anxiety levels.

COMPARISON OF SPEED AND SUGGESTED TASK FAILURE COMBINED WITH SPEED

The mean performance time under the stress of speed alone was 50.70 seconds. When speed was combined with suggested task failure it required an average of 51.69 seconds.

The analysis in Table I showed that the F-ratio was <1 which failed to meet the test of significance, indicating that there was no difference between the performances under the stress conditions of speed and suggested task failure combined with speed.

COMPARISON OF SIMPLE AND COMPLEX TASK

A total of 280 performance scores were recorded for each of the two tasks. Each task was performed twice, each time under the influence of a different stressor. The mean performance time for the simple task was 28.18 seconds and 74.21 seconds for the complex task.

The F-ratio was 1,994.18 which was significant at the .01 significance level. (See Table I). It was evident that the complex task took a significantly greater amount of time to perform than did the simple task.

INTERACTION OF STRESS AND TASK

The mean performance times were: 27.94 seconds for the simple task under the stress of speed alone; 73.46 seconds

for the complex task under the stress of speed alone; 28.42 seconds for the simple task under the stress of suggested task failure combined with speed; and 74.96 seconds for the complex task under the suggested task failure combined with speed.

The stress and task interaction F-ratio was <1, as shown in Table I, which was not significant indicating the difference between stressors was consistent over tasks and the difference between tasks was consistent over stressors.

INTERACTION OF RACE AND STRESS

The mean performance times for each race under each stress condition were: 54.56 seconds for the Negroes under the stress of speed alone; 58.15 seconds for the Negroes under the stress of suggested task failure combined with speed; 46.93 seconds for the Whites under the stress of speed alone; and 45.24 seconds for the Whites under the stress of suggested task failure combined with speed. The race and stress interaction F-ratio was 6.81 which met the test of significance at the .05 level. (See Table I).

It can be seen in Table II that the significant interaction was due to the greater difference between the Negro and White subjects under the speed combined with suggested task failure condition than under the condition of speed alone.

TABLE II

MEAN TIMES FOR RACE AND STRESS COMBINATIONS WHILE PERFORMING UNDER THE FOUR EXPERIMENTAL CONDITIONS

		Stress	
		(Speed)	(Suggested Task Failure and Speed)
Race	(Negro)	54.56	58.15
	(White)	46.93	45.24
difference		7.53	12.91

INTERACTION OF RACE AND TASK

The mean performance times were: 29.66 seconds for Negroes performing the simple task; 82.95 seconds for the Negroes performing the complex task; 26.69 seconds for the Whites performing the simple task; and 65.47 seconds for the Whites performing the complex task.

The race and task interaction F-ratio was 49.52 which was significant at the .01 significance level. (See Table I). In Table III, it can be seen that difference between the races, in favor of the White subjects, was much more pronounced in the complex tasks than in the simple tasks.

INTERACTION OF ANXIETY LEVEL AND STRESS

The mean performance time for each anxiety level and each stressor was: 48.96 seconds for the low anxious subjects under the stress of speed alone; 48.26 seconds for the low anxious subjects under the stress of suggested task failure combined with speed; 52.43 seconds for the high anxious subjects under the stress of speed alone; and 55.13 seconds for the high anxious subjects under the stress of suggested task failure combined with speed.

The anxiety level and stress interaction F-ratio, as shown in Table I, was 2.73 which failed to meet the test of significance. Thus the difference in time of performance between anxiety levels was consistent under both stress conditions.

TABLE III

MEAN TIME FOR RACE AND TASK COMBINATIONS WHILE PERFORMING UNDER THE FOUR EXPERIMENTAL CONDITIONS

	Tasks (Simple)	Tasks (Complex)
Race (Negro)	29.66	82.95
Race (White)	26.69	65.47
difference	2.97	17.48

INTERACTION OF ANXIETY LEVEL AND TASK

The mean performance time scores were: 27.60 seconds for the low anxious subjects while performing the simple task; 69.62 seconds for the low anxious subjects while performing the complex task; 28.76 seconds for the high anxious subjects while performing the simple task; and 78.80 seconds for the high anxious subjects while performing the complex task.

The anxiety level and task interaction F-ratio was 15.14 which was significant at the .01 level. (See Table I). In Table IV, the difference in time for performance between the high and low anxiety subjects is shown to be significantly greater in the complex tasks, in favor of the low anxious subjects than in the simple tasks.

INTERACTION OF RACE, ANXIETY LEVEL AND TASK

Of the three factor and four factor interactions, only one was significant. The race, anxiety level and task interaction had a F-ratio of 8.49 which was highly significant at the .01 significance level. (See Table I). This interaction indicated that the interaction found between anxiety levels and tasks was not the same for Negroes and Whites. It was found that the complex task affected the performance of the Negroes significally more than the Whites, in favor of the Whites, with this difference more pronounced for the high anxious Negroes.

TABLE IV

MEAN TIMES FOR ANXIETY LEVEL AND TASK COMBINATIONS WHILE PERFORMING UNDER THE FOUR EXPERIMENTAL CONDITIONS

		Task (Simple)	Task (Complex)
Anxiety Level	(High)	28.76	78.80
	(Low)	27.60	69.62
difference		1.16	9.18

CHAPTER V

SUMMARY, FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

This study sought to determine the influence of race and anxiety level upon performance of novel motor tasks of different complexities under the stress of speed and suggested task failure combined with speed. Specifically, the purpose was to compare high and low anxious Negro and White subjects on novel motor tasks when performed under the stress conditions of speed and suggested task failure combined with speed.

A total of 428 male students were tested on the State Trait Anxiety Inventory A-Trait Scale at Louisiana State University and Southern University in Baton Rouge, Louisiana. Seventy students from each university were selected on the basis of their scores on the anxiety scale to serve as subjects. Each subject was placed into one of the following four experimental groups: low anxious Negro, low anxious White, high anxious Negro or high anxious White. Utilizing a counter balanced practice order the subjects performed under the following four experimental conditions: (1) a simple motor task under the stress of speed alone; (2) the same simple task under the stress of suggested task failure combined with speed; (3) a complex task under the stress of speed alone; and (4) the same complex task under the stress of suggested task failure combined with speed. The tasks consisted of pushing small sticks into numbered holes on a board. The main difference between the two tasks was that the simple task

allowed the subject to look directly at the board while performing and the complex task required the subject to perform the task while looking into a mirror.

A split-plot analysis of variance in a completely randomized design was used with each plot consisting of a 2 x 2 factorial arrangement of treatments. The main plot consisted of two races, Negroes and Whites, and two anxiety levels, low and high. The sub-plot consisted of two tasks, simple and complex, and two stressors, speed and suggested task failure combined with speed.

FINDINGS

The findings in this study were as follows:

1. The White subjects required significantly less time to perform under the experimental conditions than did the Negro subjects, regardless of anxiety levels.
2. The low anxious subjects required less time to perform than the high anxiety subjects under all experimental conditions, regardless of race.
3. The White subjects performed significantly faster than the Negro subjects under both stress conditions, but the difference was more pronounced under the suggested task failure combined with speed condition.
4. The White subjects performed significantly faster than the Negro subjects under both tasks, with this difference being more pronounced in the complex task.

5. A significant interaction was found between tasks and anxiety levels in that the superiority of the low anxious subjects was significantly greater in performing the complex tasks than while performing the simple tasks.

DISCUSSION OF FINDINGS

It was found that White subjects were significantly faster than Negro subjects in the amount of time required to perfrom under all experimental conditions. This finding was not consistent with the findings of Rhodes[1] who reported that there was little, if any, difference between Negroes and Whites in motor performance at any level of development. This finding also differed with the findings of several researchers who reported that Negroes performed better than Whites. However, Lipe[2] found that Whites performed better than Negroes on two motor tasks. A possible explanation for the finding that the White subjects performed better than the Negro subjects was that fine motor tasks were administered in the present study and gross motor tasks were used in previous studies which found the Negro subjects to be superior to the White subjects in performance.

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[1]Adel Rhodes, "A Comparative Study of Motor Abilities of Negroes and Whites," Child Development, VIII (1937), 369-371.

[2]LeOra M. Lipe, "An Investigation of Aspiration and Motor Performance Levels of Negro and White Sixth-Grade Students," (unpublished Doctoral dissertation, Florida State University, 1970).

Even though no significant difference was found between the two stressors, it should be noted that the stressors affected the Negro subjects significantly differently than the White subjects. The White subjects performed faster than the Negro subjects under both stress conditions with this difference becoming greater under the suggested task failure condition. This finding was consistent with Hipple[3] who reported that White subjects performed significantly better than Negro subjects under informational motivation, which was a type of suggested task failure.

The finding that the low anxious group performed significantly better than the high anxious group and that this difference was more significant on the complex task supported the findings of several researchers. Farber and Spence[4] reported that as the task became more complex the difference between the low and high anxious groups became progressively greater. This finding emphasizes the need for considering the anxiety level as well as the task when individuals of the same race or of different races are being compared in performance.

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[3]Joseph E. Hipple, "Racial Differences in the Influence of Motivation on Muscular Tension, Reaction Time, and Speed of Movement," Research Quarterly, XXV (Oct. 1954), 297-306.

[4]I. E. Farber and Kenneth W. Spence, "Complex Learning and Conditioning as a Function of Anxiety," Journal of Experimental Psychology, XLV (1953), 120-125.

CONCLUSIONS

Within the limits of this study the following conclusions were made:

1. White college subjects are more proficient in performing a novel fine motor task under stress than Negro college subjects, regardless of anxiety level.
2. Low anxious subjects, regardless of race, are able to perform significantly better than high anxious subjects on novel motor tasks. The difference is more pronounced in a complex task than a simple task.

RECOMMENDATIONS

As a result of this study, the following recommendations were made:

1. A similar study should be conducted inducing more effective stressors.
2. A similar study should be conducted in which intelligence, socio-economic background and other pertinent factors are controlled.
3. A similar study should be conducted involving gross motor performance.

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APPENDICES

FORM USED FOR COLLECTING DATA

Students	Class Period	Teacher	A-Trait Number	Scale Score	Performance Scores 1	2	3	4

APPENDIX B

SELF-EVALUATION QUESTIONNAIRE

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I become tense and upset when I think about my present concerns	①	②	③	④

APPENDIX C

STATE-TRAIT ANXIETY SCORES AND PERFORMANCE TASK SCORES OF THE THIRTY-FIVE LOW ANXIOUS NEGRO SUBJECTS

Subjects	A-Trait Scores	Performance Scores I.	II.	III.	IV.
1	25	24	25	56	57
2	25	26	30	66	74
3	25	30	32	82	77
4	25	26	28	79	73
5	25	32	26	88	73
6	26	29	32	99	54
7	26	28	26	72	80
8	27	35	33	89	85
9	27	28	28	71	74
10	27	33	35	109	105
11	27	25	28	66	67
12	27	34	33	76	88
13	28	25	25	53	65
14	28	34	33	100	136
15	28	27	28	74	76
16	29	41	34	101	86
17	29	35	32	57	61
18	29	33	24	63	76
19	29	31	30	66	67
20	29	26	28	68	70
21	29	24	29	61	88
22	30	28	34	78	76
23	30	29	29	68	101
24	30	31	24	101	91
25	30	26	31	61	70
26	31	31	29	63	83
27	31	30	32	102	84
28	31	33	27	60	50
29	31	24	31	67	42
30	31	27	36	91	101
31	31	24	33	42	62
32	31	27	28	103	85
33	32	25	24	50	44
34	32	21	24	59	82
35	32	25	23	61	65

APPENDIX D

STATE-TRAIT ANXIETY SCORES AND PERFORMANCE TASK SCORES OF THE THIRTY-FIVE LOW ANXIOUS WHITE SUBJECTS

Subjects	A-Trait Scores	Performance Scores I.	II.	III.	IV.
1	25	24	25	50	79
2	25	28	24	68	53
3	25	27	27	51	55
4	25	25	34	60	61
5	25	23	25	92	77
6	26	30	25	63	70
7	26	25	23	50	58
8	27	32	26	83	67
9	27	25	26	59	68
10	27	25	28	73	59
11	27	29	31	56	58
12	27	26	28	62	93
13	28	29	27	58	56
14	28	36	30	95	62
15	28	23	25	83	61
16	29	29	34	80	75
17	29	23	22	55	42
18	29	25	24	50	63
19	29	34	26	68	54
20	29	31	30	101	64
21	29	23	25	80	62
22	30	21	22	46	51
23	30	24	23	61	67
24	30	28	27	44	47
25	30	30	23	70	84
26	31	26	23	61	53
27	31	29	23	59	63
28	31	21	24	63	58
29	31	26	28	80	64
30	31	27	30	79	55
31	31	22	20	52	51
32	31	27	28	68	64
33	32	26	30	76	59
34	32	23	20	73	47
35	32	24	21	51	57

APPENDIX E

STATE-TRAIT ANXIETY SCORES AND PERFORMANCE TASK SCORES OF THE THIRTY-FIVE HIGH ANXIOUS NEGRO SUBJECTS

Subjects	A-Trait Scores	Performance Scores I.	II.	III.	IV.
1	45	25	27	56	65
2	45	33	35	130	133
3	45	25	34	65	65
4	45	26	30	74	60
5	45	35	29	55	76
6	46	30	35	78	143
7	46	29	33	108	120
8	46	35	30	83	107
9	46	37	34	73	129
10	47	19	30	57	78
11	47	27	25	60	71
12	47	25	27	96	145
13	47	29	29	76	73
14	47	27	25	105	95
15	47	32	31	84	106
16	48	27	61	156	146
17	48	25	27	88	64
18	49	31	40	54	62
19	49	28	31	66	64
20	49	33	28	72	82
21	50	29	28	122	115
22	50	33	28	62	71
23	51	31	30	97	95
24	51	34	30	90	81
25	52	27	23	88	78
26	52	31	34	64	73
27	52	24	21	70	89
28	53	28	28	59	74
29	54	28	27	114	112
30	54	33	27	79	82
31	55	35	67	131	121
32	56	34	33	135	192
33	56	25	29	57	67
34	59	27	28	99	139
35	59	27	24	89	75

APPENDIX F

STATE-TRAIT ANXIETY SCORES AND PERFORMANCE TASK SCORES OF THE THIRTY-FIVE HIGH ANXIOUS WHITE SUBJECTS

Subjects	A-Trait Scores	Performance Scores I.	II.	III.	IV.
1	45	30	29	75	54
2	45	37	43	65	61
3	45	34	38	81	73
4	45	22	22	58	56
5	45	23	26	55	74
6	46	27	30	45	66
7	46	26	24	78	65
8	46	34	23	95	101
9	46	27	24	57	77
10	47	27	25	54	59
11	47	29	23	53	58
12	47	34	29	61	63
13	47	25	25	76	89
14	47	25	25	57	62
15	47	23	25	63	51
16	48	26	28	78	50
17	48	27	25	66	58
18	49	26	29	71	54
19	49	23	21	79	58
20	49	32	29	52	62
21	50	26	24	61	59
22	50	29	30	59	67
23	51	29	32	113	105
24	51	26	26	65	48
25	52	28	29	65	61
26	52	21	24	58	41
27	52	23	22	78	108
28	53	24	22	50	60
29	54	30	26	52	45
30	54	30	27	74	81
31	55	24	23	59	59
32	56	22	27	45	50
33	56	29	27	93	92
34	59	32	36	103	92
35	59	24	32	76	60

VITA

Roland Harold Vines, the son of Willie and Ruth Vines, was born in Jasper, Alabama, on October 13, 1938. The first nine years of schooling were received in the public school system of Walker County, Alabama. The remainder of the high school years was spent at Lee Academy, Cleveland, Tennessee, where he graduated in 1957.

The author attended the University of Alabama and the University of Denver. The Bachelor of Science degree was awarded from George Peabody College for Teachers in 1960 with a major in physical education and a minor in business education. The Master of Arts degree was earned at George Peabody College in 1961 with a double major in physical education and business education.

The author was employed at Gulf Coast Junior College in Panama City, Florida as an instructor, coach, athletic director, chairman of health-physical education division, director of the evening college, and administrative assistant to the president.

The author began the doctoral program at Louisiana State University, Baton Rouge, in August, 1965. He received the Doctor of Education degree in August, 1971, with a major in physical education and a minor in education.

The author is married to the former Rona Marie Morse and they have two daughters, Cynthia Marie and Cyrethia Millettee.

EXAMINATION AND THESIS REPORT

Candidate: Roland Harold Vines

Major Field: Physical Education

Title of Thesis: The Influence of Race and Anxiety Level upon Performance of Novel Motor Tasks Under Varying Stressful Conditions

Approved:

Jack K Nelson
Major Professor and Chairman

Max Goodrich
Dean of the Graduate School

EXAMINING COMMITTEE:

Mary L. Life

Helen E Jant

Dan Adam

J G. Drury

Date of Examination:

July 20, 1971